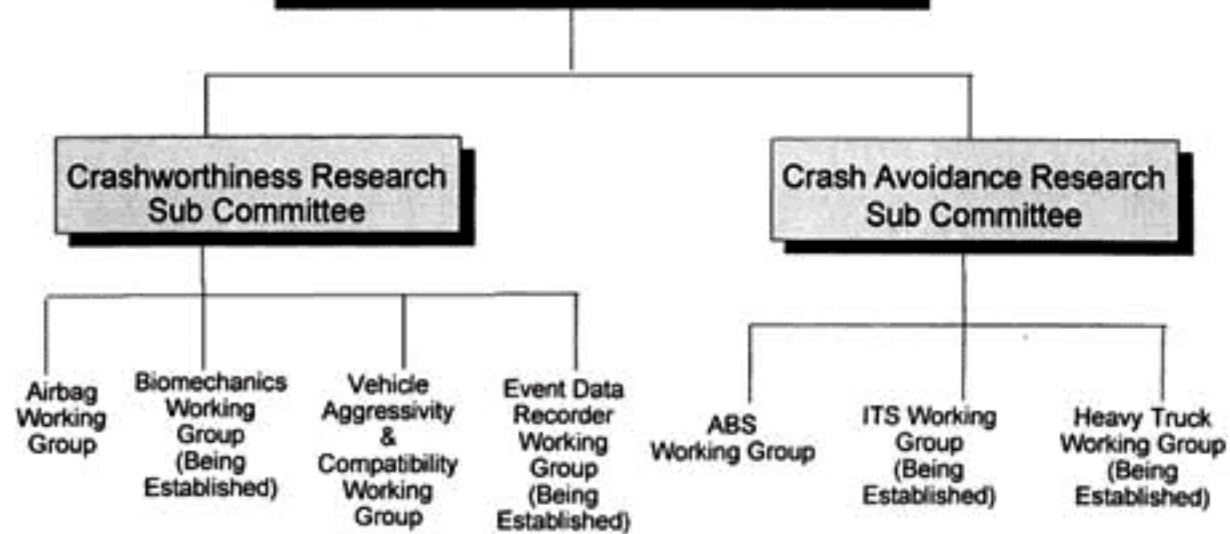


NHTSA Motor Safety Vehicle  
Research Advisory Committee

## MVSRAC Committee



### MVSRAC Members

## People Saving People

**Research & Development**

Federal Government	Automobile/Trucking Industry	Medical/Injury Researchers	Academia/Public Industry
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
	[REDACTED]	[REDACTED]	
	[REDACTED]	[REDACTED]	

### Crash Avoidance Subcommittee Members

## People Saving People

### Research & Development

Federal Government	Automobile/Trucking Industry	Medical/Injury Researchers	Academia/Public Industry
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]		
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	[REDACTED]		
	[REDACTED]		
	[REDACTED]		
	[REDACTED]		

### Crashworthiness Subcommittee Members

## People Saving People

### Research & Development

Federal Government	Automobile/Trucking Industry	Medical/Injury Researchers	Academia/Public Industry
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]		[REDACTED]
	[REDACTED]		

## MVSRAC

People Saving People

Research & Development

- 16 Members
  - 2 Non-Voting DOT
  - 1 Non-Voting other Federal
  - 13 Voting Members
- Appointment by Secretary of Transportation
- Three year terms
- Alternates

## NHTSA Resources

People Saving People

Research & Development

- CIREN
  - Auto Safety Hotline - 1 800-424-9393
- Crash Outcome Data Evaluation System (CODES)
- Fatality Analysis Reporting System (FARS)
- National Automotive Sampling System
  - Crashworthiness Data System (NASS/CDS)
  - General Estimates System (GES)
- Special Crash Investigations (SCI)

## Event Data Recorder Working Group Meeting #1

October 2, 1998

Washington; D.C.  
MVSRAC/NHTSA

Joseph N. Kianianthra, Director  
Office of Vehicle Safety Research  
National Highway Traffic Safety Administration,  
Chair, MVSRAC Subcommittee on Crashworthiness



## Agenda

- Working Group Objective
- Meeting Objective
- Opening Remarks (Ray Owings)
- Welcome and Introduction (Joe Kianianthra)
- Background
- Break (Manufacture discussion of EDR technology)

Research & Development



## ***Agenda***

- **Lunch (Discussion of the Need for Crash Data and privacy issues)** 15min each group
- **Break**
- **Committee Work Areas**
- **Committee Working Process**

Research & Development



[Http://www.nhtsa.dot.gov](http://www.nhtsa.dot.gov)

## ***Welcome***

- AAAM
- Blue' Bird
- Chrysler ,
- FHWA
- Ford
- Navistar
- GM
- NASDPTS
- NTSB
- Private
- TRB
- UVA
- VW

Research & Development



[Http://www.nhtsa.dot.gov](http://www.nhtsa.dot.gov)

## ***Meeting Objectives***

- **Formulate working group goals**
- **Discussion of current EDR technology used by manufacturers**
- **Discussion of EDR needs**
- **Discussion of privacy issues related to EDR data**
- **Develop a work plan for the working group**

Research & Development



[Http://www.nhtsa.dot.gov](http://www.nhtsa.dot.gov)

## ***Background***

- **Need for real world crash data - crash pulses**
- **Today - methodology based on observation of post crash vehicle deformation**
- **Need for more detailed data to define crash conditions (pre-impact conditions, detailed deceleration data)**
- **NHTSA spends \$20 million/year on crash data**

Research & Development



[Http://www.nhtsa.dot.gov](http://www.nhtsa.dot.gov)

## ***Background (cont'd)***

- **Circa 1973 a fleet was equipped with recorders , ,**

- Accumulated about 26 million miles
- 23 crashes
- Delta-Vs up to about 20 mph
- Actual deceleration-time histories recorded

- **Automated Collision Notification (ACN)**

- 600 units installed in volunteer's vehicles in the Buffalo area
- Involved in about 10 crashes .

Research & Development



## ***NTSB***

- **NTSB public forum on air bags and child passenger safety**

- **NHTSA (H-97-18)**

- ***"Develop and implement, in conjunction with the domestic and international manufacturers, a plan to gather better information on crash pulses and other crash parameters in actual crashes, utilizing current or augmented sensing and recording devices."***

Research & Development



## ***JPL***

- **1997 recommendation for NHTSA to work on EDR technology**

- **Study-feasibility of installing and obtaining crash data for safety analyses from crash recorders on vehicles**

- **Crash recorders exist already on some vehicles with electronic air bag sensors, but data recorded are determined by the OEMs**

- These recorders could be basis for an evolving data-recording capability that could be expanded to serve other purposes
  - o Emergency rescues - information could be combined with occupant smart keys to provide critical crash & personal data to paramedics

Research & Development



## ***Petition for EDRs***

- **NHTSA is currently evaluating a request to require EDR technology on all new passenger vehicles**

- **The petitioner believes this technology could have provided evidence that would have been valuable in determining crash scenarios**

- **A decision is expected in the near future**

Research & Development



## ***MVSRAC Meeting***

- On April 29, 1998, NHTSA staff presented a briefing to the MVSRAC full committee
- Purpose was to recommend that a working group be formed
- MVSRAC members indicated it would be several years before such devices would be wide spread enough to give researchers information on crashes
- MVSRAC members indicated that some manufacturers were not far along in EDR technology
- MVSRAC Crashworthiness Subcommittee would start EDR working group

Research & Development



## ***Technical Objectives***

- Define functional and performance requirements for on-board crash data recorders
- Understand technology presently available to meet these requirements
- Develop a set of data definitions
- Discuss the various uses of the data

Research & Development



## ***Benefits***

- Timely data on highway safety problems
  - Crash pulses
  - Air bags
- Reduced cost of data collection
- Major improvement in crash reconstruction

Research & Development



## ***Data***

- Vehicle
- Speed, brake application, ABS, etc.
- Occupant
- Number, seat belt, etc
- Environment
- Location, conditions
- Pre-crash
- Crash
- Post-crash

Research & Development



## ***Pre Crash***

- VIN
- Time/date
- Location
- Environment (wet, ice, temp, etc.)
- Vehicle speed
- Brake status (service & ABS)
- Belt status, number of occupants

Research & Development



## ***Pre Crash (cont'd)***

- Throttle status
- Steering wheel angle
- Transmission' selection
- Collision avoidance sensors (outputs/statuses)

Research & Development



## ***Crash***

- Crash pulse
- Delta-V, longitudinal and lateral
- Air bag inflation time (time from start of crash to start of air bag inflation)
- Air bag status
- Yaw rate (stability control)

Research & Development



## ***Post Crash***

- Location
- Advanced systems
  - Automatic" collision notification

Research & Development



## ***The Haddon Matrix w/o EDR***

	Human	Vehicle	Environment
<b>Pre</b>			
<b>Crash</b>		Infer DV	
<b>Post</b>	Injury	Crash	Environment after crash

Research & Development



## ***The Haddon Matrix w/ EDR***

	Human	Vehicle	Environment
<b>Pre</b>	Belts Steering B r a k e	Speed ABS Other Controls	Conditions
<b>Crash</b>	Air Bag Pre Tensioners	Pulse DV Yaw A/B inflation time	Location
<b>Post</b>			

Research & Development



## ***Data Issues***

- . Sample rate
- . Delta-t (time between samples)
- . Filtering
  - Analog
  - Digital
- . Download compatibility
- . Types of devices
- . Hardware & software needs
- . Validation of EDRs

Research & Development



## ***Data Ownership***

- . Discussions on who owns the EDR data
- . Historical overview of other agency's actions related to data collection

Research & Development



## ***Analysis of EDRs in Real-World Crashes***

- . NRD currently uses EDR data in crash investigations
- . SCI case IN9618
  - Reconstruction delta-V = 11 mph
  - EDR delta-V = 24 mph
- . SCI case TRC/IU 9629,
  - Reconstruction delta-V = 14 mph
  - EDR delta-V = 8.9 mph

Research & Development



## ***Analysis of EDRs in NHTSA's NCAP and 208 Tests***

- . Validation Effort
- . 20 1998 GM vehicles
- . NCAP and compliance tests
- . Data currently being downloaded by GM
- . Report on results for next meeting

Research & Development



NFSB  
DRAFT



### **Information for Transportation Safety Sharing the Knowledge**

**Goal:** Sharing the Knowledge and Experience Gained from the use of Recorded Information to Improve Transportation Safety and Efficiency.

DRAFT

### **Objectives**

- ♦ Provide Overview of the Current State of Transportation Recorder Technology;
- ♦ Identify Methods to Expand the Use of Recorded data to Improve Safety and Efficiency;
- ♦ Identify Future Needs and Requirements for Transportation Recorder;
- ♦ Publish Symposium Proceedings (*CD, Web Page, Hard Copy.*)



**DRAFT**

## Presentation Formats

- ✦ Formal Papers and 30 min. Presentation;
- ✦ Panel Discussions;
- ✦ Formal Papers without Presentation;
- ✦ Poster Presentation;
- ✦ Vendor Exhibits.



**DRAFT**

## Session I

- ✓ ✦ **Transportation Recording - Overview**
- ✓ ✦ *Note: Overview to include all type of recordings (onboard and fixed); and how the recorded information can be use in accident/incident investigations and routine performance monitoring.*
- ✦ **Chairman: TBD**
- ✦ 9:30 1st Speaker Marine (VDR, Shore Radar/Audio, etc.)
- ✦ 10:00 2nd Speaker Aviation (FDR/CVR, ATC Radar, QAR, Data Link, etc.)
- ✦ 10:30 Coffee
- ✦ 10:45 3rd Speaker Highway (Accelerometers, Nonvolatile memory, Tachograph, Highway Video Monitors, etc.)
- ✦ 11:15 4th Speaker Pipeline (Control Facility, etc.)
- ✦ 11:45 5th Speaker Rail (Event Recorders, Remote Recording Systems, Positive Track Control, etc.)
- ✦ 12:15 Lunch



**DRAFT**

## Session II

- ✓ ✦ **Recorder Standards Note:** Covers *Crash/Fire Survivability, Data Formats, Industry Interchangeability, Regulatory Requirements, Recorder Sys. Maintenance, etc.*
- ✦ **Chairman: TBD**
- ✦ 1:15 6th Speaker Aviation (ICAO, ARINC, ED, FM, JAA)
- ✦ 1:45 7th Speaker Marine (IMO, IEC, SOLAS, etc.)
- ✦ 2:15 8th Speaker Rail (RSAC, FRA, etc.)
- ✦ 2:45 Coffee
- ✦ 3:00 9th Speaker Motor Vehicle (SAE, etc.)
- ✦ 3:30 10th Speaker Pipeline
- ✦ 4:00 11th Speaker International (Experience)
- ✓ ✦ 4:30 Panel Discussion *Need for Standardization*
- ✦ **TBD Close Day 1**



**DRAFT**

## Session III

- ✦ **Proactive Use of Recorded Data to Prevent Accidents and Improve Operational Efficiency Note:** should include government and industry sponsored programs.
- ✦ **Moderator: TBD**
- ✦ 9:15 1st Speaker FAA (FOQUA, GIN)
- ✦ 9:45 2nd Speaker USAirways (FOQUA)
- ✦ 10:15 Coffee
- ✦ 10:30 3rd Speaker Rail (Operator Experience)
- ✦ 10:45 4th Speaker Rail (Operator Experience)
- ✦ 11:15 5th Speaker Marine (Operator Experience)
- ✦ **Lunch (1:15 Speaker??)**
- ✦ 1:00 6th Speaker Motor Vehicle (Operator Exp.)
- ✦ 1:30 7th Speaker Pipeline (Operator Experience)
- ✦ 2:00 8th Panel Discussion (Benefits-Safety, Economy, etc.)
- ✦ **2:45 End Session III**



**DRAFT**

## **Session IV**

- ♦ **Expanding Access to Data - Issues: Privacy, Proprietary, Unions Restrictions, Security, etc. Note:** Discuss ways to expand the use of recorded data for safety and economic purposes while taking into consideration the sensitivity of the data, and the associated legal implications.
- ♦ **Moderator: TBD**
- ♦ 3:00 9th Speaker (*International Aviation - ZCAO*)
- ♦ 3:30 10th Speaker (*International Marine - IMO*)
- ♦ 4:00 11th Speaker (*U. S. Experience*)
- ♦ 4:30 Panel Discussion (*Sharing/Protecting the Data*)
- ♦ **TBD Close Day 2, Session IV**



**DRAFT**

## **Session V**

- ♦ **Defining Future Recorder Needs and Requirements**
- ♦ **Note:** Speakers should be familiar with projected technological advances, and the impact it will have on the future needs and availability of recorded data for their respective mode.
- ♦ **Moderator: TBD**
- ♦ 9:15 1st Speaker *Aviation (Overview of Future)*
- ♦ 9:45 2nd Speaker *Marine (Overview of Future)*
- ♦ 10:30 3rd Speaker *Rail (Overview of Future)*
- ♦ 10:45 4th Speaker *Motor Vehicles (Overview of Future)*
- ♦ 11:15 5th Speaker *Pipeline (Overview of Future)*



**DRAFT**

## **Session VI**

- ♦ **Advanced Recording Systems**
- ♦ **Moderator: TBD**
- ♦ 1:00 6th Speaker *Video Recorders*
- ♦ 1:30 7th Speaker *Digital Data Transmission*
- ♦ 2:00 8th Speaker *Solid State Memory Devices*
- ♦ **2:30 Coffee**
- ♦ 3:00 9th Speaker
- ♦ 3:30 10th Speaker
- ♦ 4:00 11th Speaker
- ♦ 4:30 Panel Discussion
- ♦ **5:00 Close Symposium**



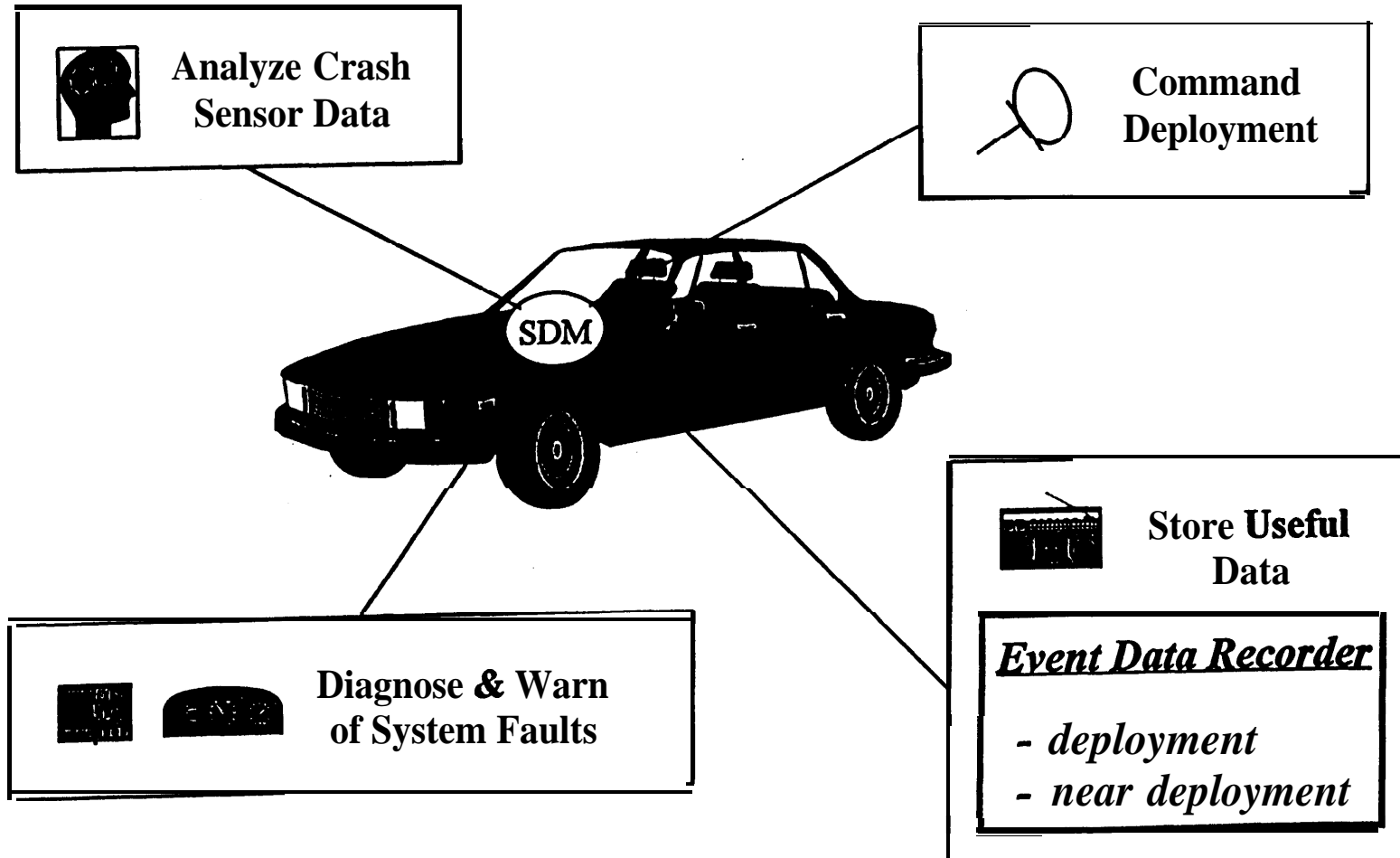
**DRAFT**

## **Action Items**

- ♦ Symposium Facility;
- ♦ Identify Modal Speakers/Presenters;
- ♦ Abstract/Paper/Poster Approval Committee;
- ♦ Identify Session Moderators;
- ♦ Coordinate Vendor Exhibits;
- ♦ Audio Video Coordination;
- ♦ Handout Material;
- ♦ Web Page Coordinator;
- ♦ Public Affairs Coordinator;
- ♦ Legal Coordinator.



# Airbag Sensing & Diagnostic Module Functions



# Data Stored in Event Data Recorder

## **Currently**

- Airbag system data
  - What it did
  - Why it did it
- Longitudinal vehicle velocity change vs. time
- Driver belt switch status

## **Planned Additions**

- Preimpact Data
  - Vehicle speed
  - Engine speed
  - Brake switch status
  - Throttle opening

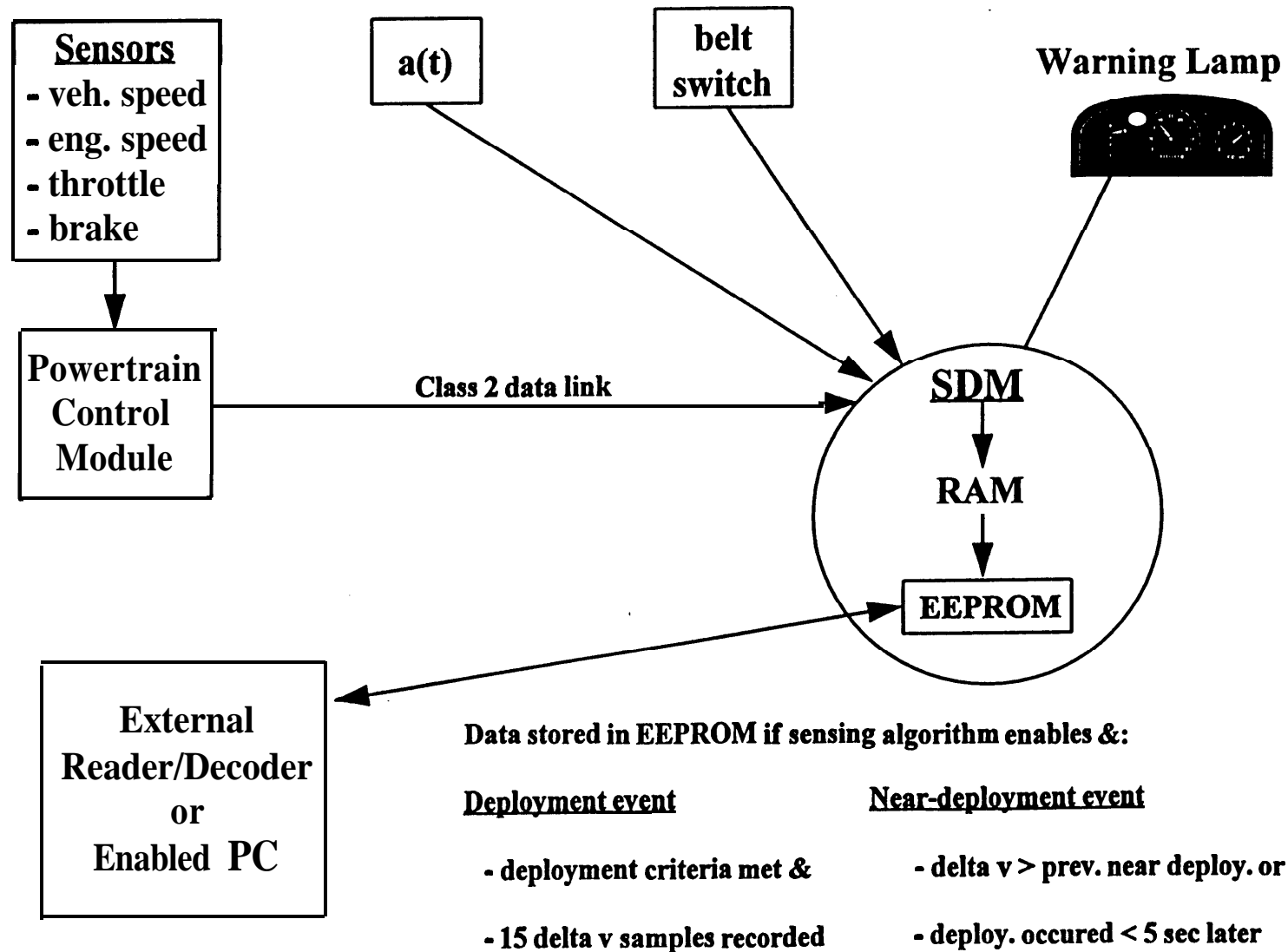
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EDRDATA

# How Event Data Recorder Works

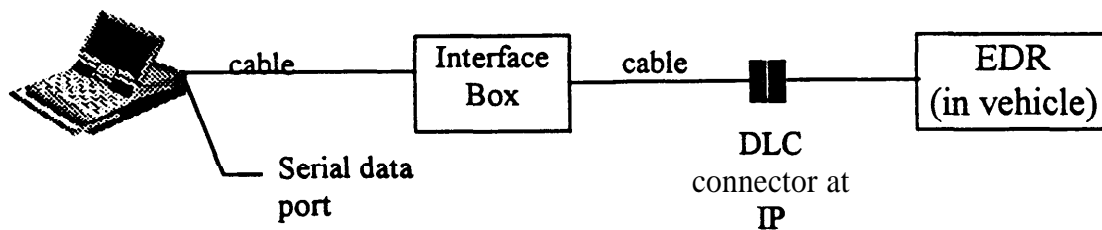


## PC-based tool status

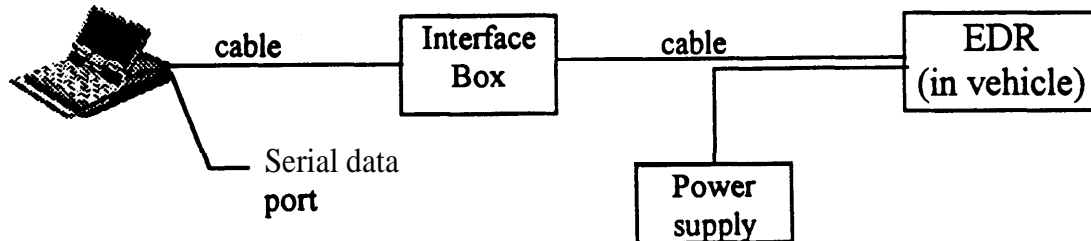
### Strategy to Read-out Event Data

- Requires developing **user-friendly** tool to access data
- RFQ sent out in July '98 to 4 candidate suppliers. RFQ re-issued in August. 2nd round quotes due week of **9/14**.
- Requirements to read EDR data:
  - 486 or better laptop running Windows 95 or higher.
  - Reader kit including 2 cables, interface box, power supply, PC **software**
- Kits available around 1st quarter '99.

#### In-vehicle hookup

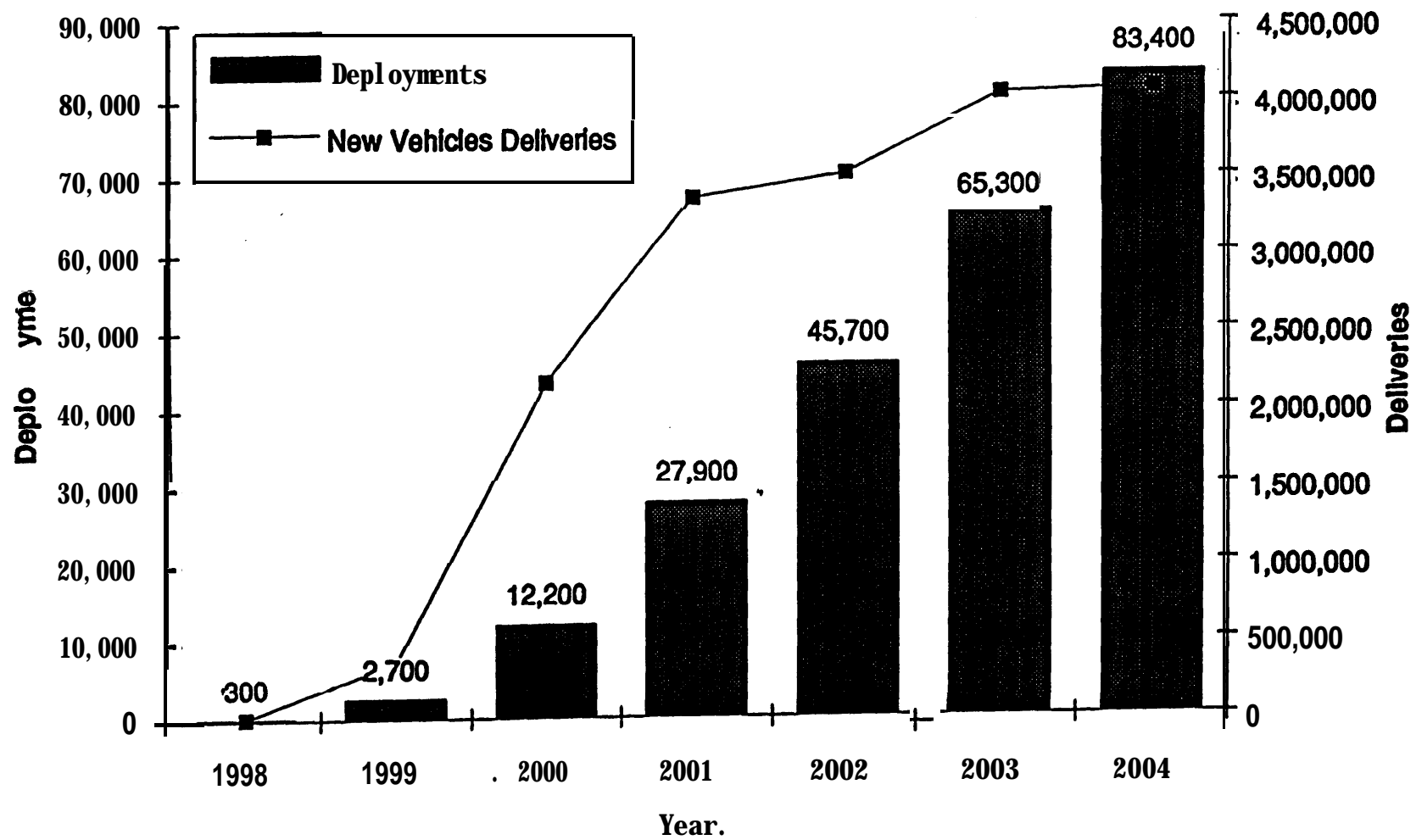


#### Out-of-Vehicle Hookup



•

### Current Projections of EDR Availability



# Uses of Objective EDR Data

- **Improving**
  - **vehicle systems**  
e.g. **airbag** sensing system algorithm
  - **highway systems**  
e.g. roadside obstacle design standards
- **Regulatory initiatives**  
e.g. severity of offset **frontal** impacts
- **Alleged defect investigations**  
e.g. unintended acceleration
- **Litigation cases**  
e.g. defective **airbag** system claims
- **Driver behavior initiatives**
- **Law enforcement efforts**

# Information of Value to National Data Center

## **For Deployment and Near Deployment Events**

- Preimpact Data
  - Vehicle speed
  - Engine speed
  - Brake switch status
  - Throttle opening
- Longitudinal vehicle velocity change vs. time
- Driver belt switch status
- Ignition cycle count
- Warning lamp status

## **For Deployment Events**

- Time from “Algorithm Enable” to “Deployment Command”
- Time between “Near Deployment” and “Deployment”

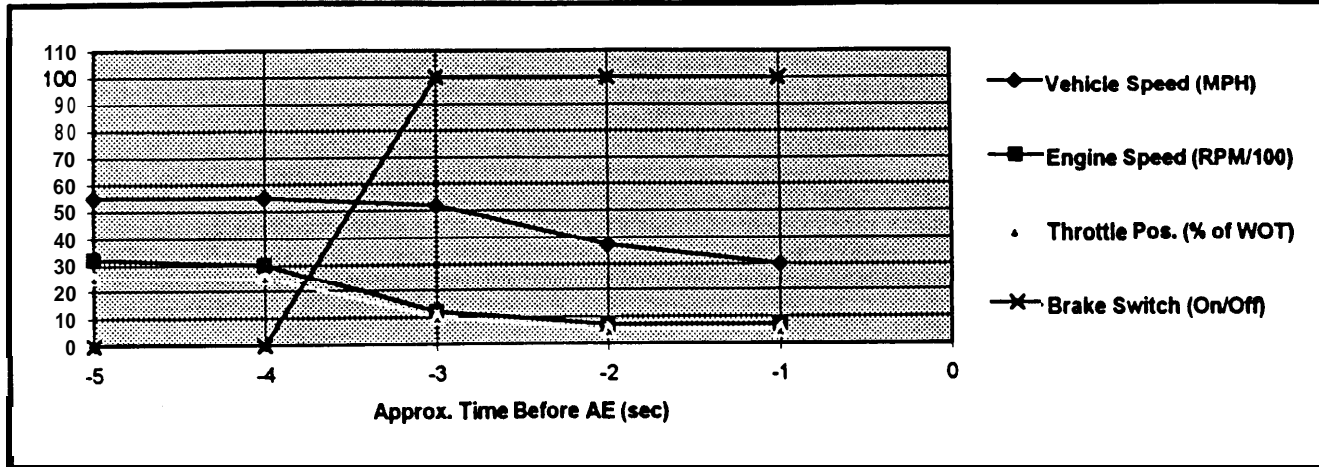
## **For Near Deployment Events**

Time between “Algorithm Enable” and “Maximum Change in Longitudinal Vehicle Velocity”

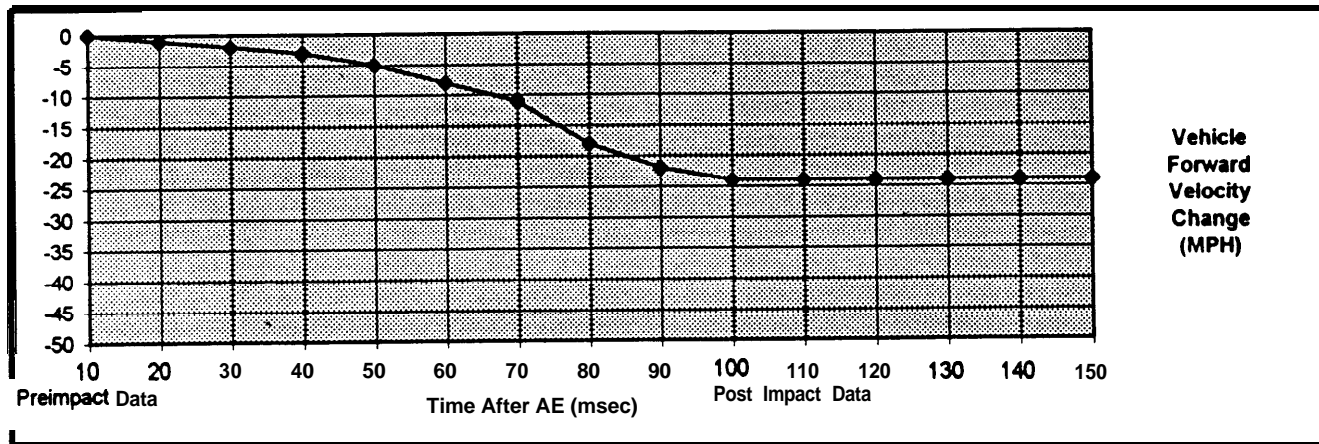
## EDR Summary - Deployment

Case No.	Investigator	Systems Status @ Deployment	
Vehicle & Mod.	Investigation Date	SIR Warning Lamp Status	
Model Year	Crash Severity Metric	Driver Belt Switch Status	
VIN	Ignition Cycles @ Investigation	Pass. SIR Supp. Switch	
Crash Date		Ignition Cycles @ Deploymt.	

### Pre-Crash Data



### Post-Crash Data



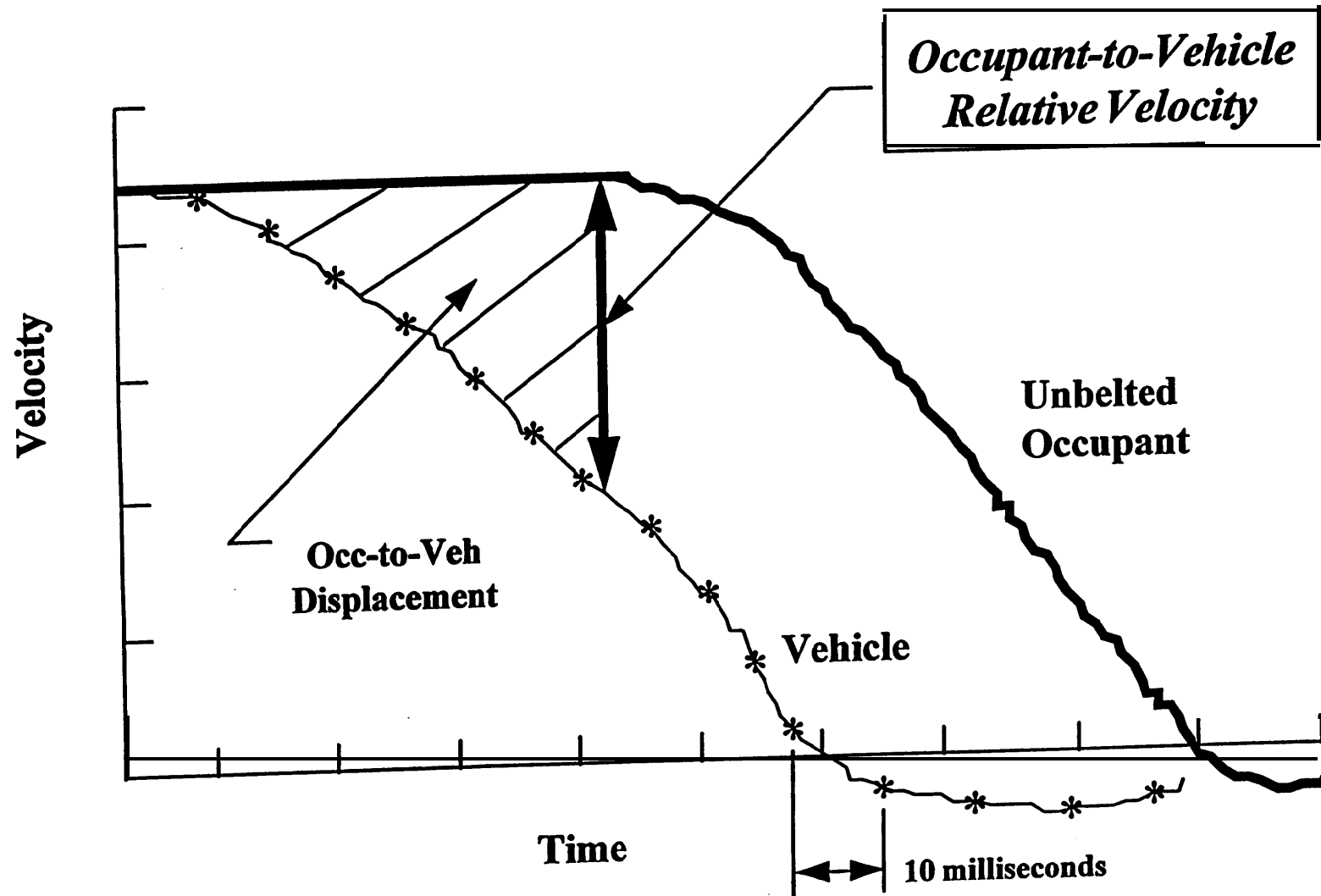
Pre-Crash Data				
Secs. Before AE	Vehicle Speed (MPH)	Engine Speed (RPM)	Throttle Position (% WOT)	Brake Switch (On/Off)
-6	55	3200	25	Off
-4	55	3000	25	Off
-3	51	1200	10	On
-2	38	800	5	On
-1	30	800	5	On
Electronic Data Validity Check Status				Valid

Post-Crash Data					
msec after AE	Vel. Chg. MPH	msec after AE	Vel. Chg. MPH	msec after AE	Vel. Chg. MPH
10	0	60	-8	110	-24
20	-1	70	-12	120	-24
30	-2	80	-18	130	-24
40	-3	90	-22	140	-24
50	-5	100	-24	150	-24
Time from AE to DC (msec)					68.7
Time from ND to Dep. (msec)					N/A

AE - Algorithm Enable (SIR sensing system)  
DC - Deployment Command  
ND - Near Deployment

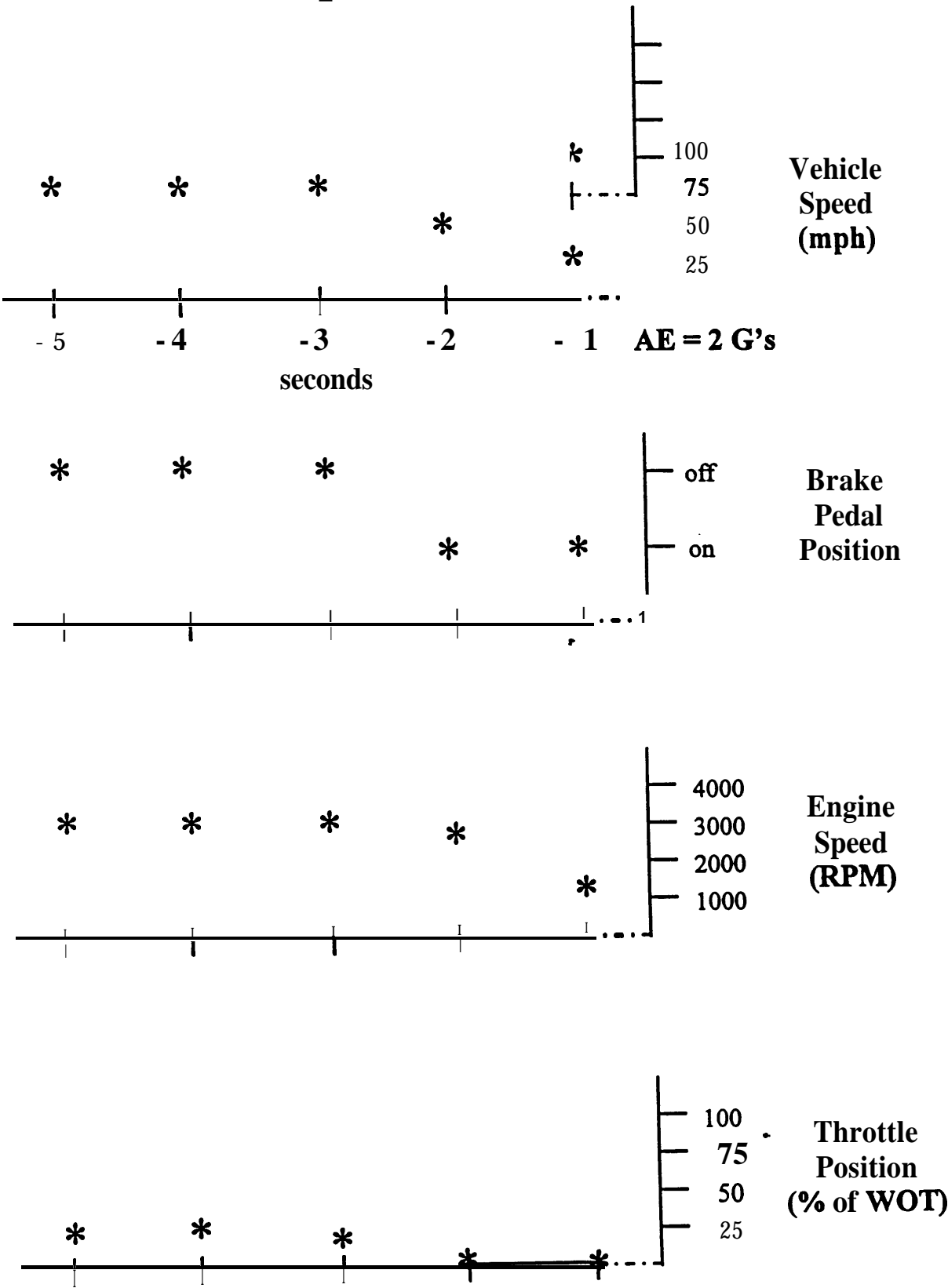
SIR - Supplemental Inflatable Restraint system  
WOT - Wide Open Throttle

# Possible Frontal Crash Severity Metric



FRTmet

# Preimpact EDR Data



## EDR Rental Fleet

- First Deployment Notification

1998 Cadillac DeVille

Enterprise Leasing

- Monroe Township, New Jersey

- May 4, 1998

Driver only occupant

- Facts:

- Head-on **collision** with 1988 Ford Taurus

Both air bags deployed in Cadillac

Driver Injuries: broken wrist, collapsed lung

Belted **Driver:** physical evidence

- **Radiator** pushed rearward 12 in. / Front wheels pushed rearward 4 to 6 in, / Battery split open

- **SDM Data:**

Normal Air Bag Deployment

No malfunctions or fault codes stored

- Delta V: 28.96 mph @ 120 msec.

Belted Driver; SDM Deployment **File**

- **EDR Data:**

- EDR information **incomplete**

Recorded brake switch and throttle position

- \* No **brake** activation 8 seconds prior to impact

- \* 4.3 % **WOT** 4 seconds prior to impact

Missed **engine** RPM and vehicle speed

# **Future Event Data Recorder Possibilities**

- SIR automatic suppression system status
- Passenger seat belt status
- Belt pretensioner status
- Lateral impact crash delta V at undeformed passenger compartment  
(requires lateral acceleration data)
- Direction of force applied to passenger compartment  
(requires lateral acceleration data)
- Status of “throttle-by-wire” system
- Rear impact crash severity descriptor

**EVENT DATA RECORDER (EDR)**  
**PARAMETERS IMPORTANT TO FHWA**  
(✓ Parameters currently collected in GM Vehicles)

**PRE-IMPACT**

- ✓ **Vehicle speed —** If collected in EDR memory and reported in FARS and/or NASS, this parameter is considered a top priority by FHWA's Office of Highway Safety and Office of R&D. At present, using reconstruction techniques, the speed prior to impact is always considered questionable.
- ✓ **Brake switch status,**
- ✓ **Throttle Opening (percent),**
- Steering wheel input —** If collected in EDR memory and reported in FARS and/or NASS, these three parameters are very important to both the Offices of Safety and R&D. These parameters would provide driver response information that could influence future updates of Roadside Safety Hardware crash test acceptance specifications to better reflect "real world" impact conditions.

## **POST-IMPACT**

**Location of accident (GPS data) —** If collected in EDR memory and reported in FARS and/or NASS, this parameter is considered the most important data item by FHWA's Office of Highway Safety. Location data would provide for the exact determination of locations on the National roadway system that may be flawed from a safety standpoint.

- ✓ **Longitudinal velocity change vs. time —** When combined with the pre-impact speed of the vehicle, the longitudinal speed of the vehicle during collision can be determined and reported in FARS and/or NASS accident records. In addition, the occupant-to-vehicle impact velocity can be approximated for the unbelted occupant and reported.

**Longitudinal acceleration vs. time —** If collected in EDR memory and reported in FARS and/or NASS, this information would be of great use to researchers associated with FHWA R&D.

**Occupant and ✓driver belt status,**

**Occupant seating positions —** These parameters are of importance to both the FHWA Offices of Safety and R&D, if collected in EDR memory and reported in FARS and/or NASS. These parameters would also provide restraint information such that future updates of **Roadside Safety** Hardware crash test acceptance specifications can better reflect “real world” occupant restraint usage and associated injury tolerances.

**Time of day —** If collected in EDR memory reported in FARS and/or NASS, day/night driving conditions are useful to FHWA’s Office of Highway Safety.

## Potential EDR Data

- speed & speed profile
- steering inputs
- braking inputs
- throttle settings/accelerator inputs
- location (GPS)
- time
- pavement friction
- wheel rotation
- seat belt usage
- yaw/pitch/roll measures
- impact velocity
- occupant/load distribution
- suspension pulse history
- crush zone history
- driver condition
- vehicle id/equipment status



## Potential Safety Research Uses of EDR Info

- verify speed & angle of impacts
- assess side-slope effects on roll propensity
- effectiveness of “softer” roadside devices
- adequacy of severity indices
- driver behavior in ROR events
- off-road soil-tire interactions
- effects of curbs
- clear zone distance requirements
- correlations to crash test results
- potentials for supplementing police reports
- validation of simulations
- accident reconstruction
- incident linkages to ITS

**MVSRAC WORKING GROUP on EVENT DATA RECORDERS**  
**MEMBER LIST (Invited and nominated)**  
**October 27, 1998**

Name	Company	Phone	Fax	Company Address	e-mail
David <b>Bauch</b>	Ford	3 13 322-3884	3 13 390-5144	Advanced Vehicle Tech <b>#3, 2A149</b> Rm 2122, Mail Drop 30 <b>10</b> , Ford Motor Company, Dearborn, MI 48 12 1	<b>dbauch@ford.com</b>
Robert Cameron	W	201894-6245	20 1 894-5498	Volkswagen of America, 600 Sylvan Ave, <b>Englewood</b> Cliffs, NJ 07632	<b>Robert.Cameron@vw.com</b>
John Carney	Worcester	<b>508</b> 83 1-5222	<b>508</b> 83 1-577-c	Worcester Polytech. Institute, 100 Institute Rd, Worcester, MA 0 1609-2280	<b>jfc@wpi.edu</b>
Charlie Gauthier	NASDPTS	703 <b>734</b> - 1620	703 734- 1868	<b>1604</b> Longfellow St, McLean, VA 22 10 <b>1</b>	
Kathleen Gravino	Chrysler	248 576-36 13	248 <b>576-0818</b>	<b>800</b> Chrysler Drive, Auburn Hills, MI <b>48326-2757</b>	<b>kmg15@chrysler.com</b>
Martin Hargrave	FHWA	703 <b>285-2508</b>	703 285-2679	FHWA, HSR-20, Turner Fairbanks Highway Research Center, 6300 <b>Georgetown</b> Pike, McLean, VA <b>22101-2296</b>	<b>martin.hargrave@fhwa.dot.gov</b>
John Hinch	NHTSA-R&D	202 366-5 195	202 366-5930	NHTSA, NRD-0 1,400 <b>7<sup>th</sup></b> St SW, Washington, DC 20590	<b>john.hinch@nhtsa.dot.gov</b>
Thomas <b>Kowalick</b>	Private	9 <b>10</b> 692-5209	910 695-1566	560 East Massachusetts Ave, Southern Pines, NC 28387	<b>kowalick@pinchurst.net</b>
Tom <b>Mercer</b>	GM	8 <b>10</b> 986-3552	8 <b>10</b> 986-3547	GM Tech Center, Mail Code <b>480-111-S29, 30200</b> Mound Road, Warren, MI 48090-9010	<b>LNUSTC1.ZZMY5T@gmeds.com</b>
Ken <b>Opiela</b>	TRB	202 334-3237	202 334-2006	Transportation Research Board, NRC, 2 101 Constitution Ave, Washington DC 204 18	<b>kopiela@nas.edu</b>
Jeya Padmanaban	AAAM	650 94 <b>1-5304</b>	650 941-2132	35 <b>Sylvian</b> Way, Los Altos, Ca 94022	<b>jcyap@aol.com</b>
Ray Peck	California Dept of Motor Vehicles	9 16 657-7036	9 16 657-8589	Department of Motor Vehicles, R&D Branch <b>F126, 24 15</b> First Ave, Sacramento, CA 958 18	<b>rpeck@dmv.ca.gov</b>
Vernon Roberts	<b>NTSB</b>	202 3 14-6483	202 3 14-6482	NTSB, HS-1,490 <b>L'Enfant</b> Plaza East SW, Washington, DC 20594	<b>robertv@ntsb.gov</b>
Wilbur C Rumph	Blue Bird Bus	9 12 822-2368	9 12 822-247 <b>1</b>	Blue Bird Body Co.; PO Box 937; Fort Valley, GA 3 1030	
Brian <b>Shaklik</b>	Navistar	2 19 428-3205	219 428-3501	Navistar Technical and Engineering Center, 2911 Meyer Rd, Fort Wayne, IN 46801	<b>Brian.Shaklik@Navistar.com</b>
Greg Shaw	UVA	804 296-7288	804 296-3453	UVA Auto Safety Lab, Charlottesville, VA	<b>cgssw@virginia.edu</b>
Sharon Vaughn	NHTSA-NCC	202 366-1834	202 366-3820	NHTSA, NCC-30,400 <b>7<sup>th</sup></b> St SW, Washington, DC 20590	<b>sharon.vaughn@nhtsa.dot.gov</b>

**LIST OF ATTENDEES**

Event Data Recorder (EDR)

Working Group Meeting #1

October 1, 1998

Room 4236

9:00 am - 4:00 pm

<b>#</b>	<b>NAME</b>	<b>OFFICE/ ROUTING SYMBOL</b>	<b>PHONE</b>
1	Linda McCray	NRD-11	202-366-6375
2	Richard Compton	NTS-30	202-366-2699
3	Charles Gauthier	National Assoc. of State Directors of Pupil Transport	703-734-1620
4	Martin Wittargrave	HSR-20	703-285-2508
5	James Wentworth	FHWA.HSR-20	703-285-2057
6	Bnan Shaklik	Navistar	215-627-0048
7	Richard Powers	FHWA/HNG-14	X61 320
8	Vernon Roberts	NTSB/HS-I	202-314-6483
9	Richard F. Humphrey	GM 1660 Lst., NW 20036	202-775-5071
10	Don Hillebrand	Chrysler 1401 H St. 20005	202-414-6711
11	Robert Ferlis	FHWA HSR- IO	703-285-2680
12	Ken Rutland	NHTSA, NRD-32	202-493-0055
13	Chip Chidester	NHTSA, NRD-32	202-366-5393
13	Ed Jettner	NH-ISA, NPS-I I	202-366-4917
15	Ken Opiela	TRB	202-334-3237
16	Tom Mercer	GM	810-986-3552
17	Kathy Graiino	Chrysler	248-576-3613
18	David Bauch	Ford	313-322-3884
19	Tom Kowalick	Click, Inc.	910-692-5209
20	Sharon Y. Vaughn	NCC-30/NHTSA	202-366-1834
21	Bob Cameron	VW of America	201-894-6245
22	Jeya Padmanaban	JP Research	650-941-5304
23	Joseph Kanianthra	NHTSA/NRD-10	202-366-4725
23	Ray Owings	NHTSA/NRD-01	202-366-1537
25	Rita Gibbons	NHTSA/NRD-10	202-355-486